CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Optimizing facility layout is an important problem for modern manufacturing systems and it plays a key role for designing the process and material flow. Manufacturing facilities design is the company's physical assets to promote the efficient use of resources such as worker, material, equipment, time and cost. Facilities design includes plant location, process flow, plant layout and material handling systems. Only the proper process flow of layout can ensure the smooth and rapid movement of material, from the first stage of material until the end of process. Optimizing the flow layout also can reduced the wastes or non value added activities in the production lines and improve the overall effectiveness in the production.

In manufacturing industry, there are two main problems that need to be considering for the facility layout (Sahin et al., 2009). The first one is the quantitative approach aiming at minimizing the total material handling cost between workstations based on a distance function. Secondly is the approach aiming at minimizing the non value added activities. Material handling and process flow have close relationship in production. Material handling accounts for a significant portion of the total production cost. Workers and materials have to travel long distances in the course of the manufacturing process; this leads to loss of time and energy and nothing is added to the value of the product. Through effective plant layout analysis and design, much

material handling operations can be reduced or eliminated. The choice of material handling methods and equipment is an integral part of the plant layout design. Furthermore, by optimizing the process flow, it will maximize the closeness between the workstations and effectively reduce the cross flow cause by workers in the production lines.

Plant layout can be defined as a technique of locating and arrangement of the physical facilities such as equipment, machines, tools, furniture etc. in such a manner so as to have quickest flow of material at the lowest cost and with the least amount of handling in processing the product from the receipt of raw material to the delivery of the final product (Abha Kumar, 1999). According to (J. L. Zundi, 2000), Plant layout ideally involves allocation of space and arrangement of equipment in such a manner that overall operating costs are minimized. Plant layout encompasses new layout as well as improvement in the existing layout.

There are three types of the main layout which are process layout, product layout and fixed-position layout. All machines performing similar type of operations are grouped at one location in the process layout. Fixed-position layout is design for stationary project. Workers and equipment come to the site. In product layout, the machines and equipment are arranged in one line depending upon the sequence of operations required for the product. This project focus on the product layout which is same with the current layout of the cell because of the space available, the machines, the equipment and the process flow is suitable for this type of layout. In this cell, work is done in small amount at each of the workstations in the work unit. This means the cell is suitable with product layout because the total work must be dividable into small tasks that can be assigned to the workstations. In product layout, the stations are specialized in their tasks with specialized equipment and tooling, which leads to high proficiency, reduced cycle time and also leads to a higher production rate. Furthermore, from the opinion of the process engineer in the company, the type of layout will be the same as the current layout because the other Agilent productions are in the cell and also the limited of space in the cell. The shape of the current cell is used U- shaped. Generally a horseshoe or U-Shaped work area layout that enables workers to easily move from one process to another in close

proximity and pass parts between workers with little effort. After the equal allocation of tasks to each stage in the line was decided, the future shape of the layout can be chosen.

The principles of lean manufacturing have become state-of-the-art in modern manufacturing design and its implementation has become a vital pre-requisite in global competition (Matt, 2008). Lean production is most frequently associated with elimination of waste commonly held by firms as excess inventory or excess capacity (machine and human capacity) to ameliorate the effects of variability in supply, processing time, or demand. Lean manufacturing principles and tools are very important in designing the layout. Line balancing is one of effective tool in lean manufacturing to improve the throughput of assembly lines and work cells while reducing manpower requirements and costs. Assembly line balancing is the main problem of assigning operations to workstations along an assembly line. Line balancing is used in this study to achieve the minimization of the number of workstations and workers, the minimization of cycle time, the maximization of workload smoothness and work relatedness. One of the important tools in Lean manufacturing used by engineers in work measurements is time study and specifically stopwatch time study. Time study that originated by Taylor and developed by Gilbreths was used mainly for determining time standards and motion study.

In this project, BI Technologies Corporation Sdn. Bhd, the electronic company has been selected to perform the modification and improving the existing production flow layout. This company has been an innovator and leader in electronic components for more than 50 years. Initially, the company was established in 1976 as Pahang Electronics Sdn Bhd, a Pahang state agency with the commercial agreement that Astec International Hong Kong will provide technical assistant in the manufacturing of Modulators for the TV industry. The company then known as BI Technologies Corporation (M) Sdn Bhd. In 2000, the company becomes a wholly owned subsidiary of TT electronics. The company vision is to become one of the world’s largest manufacturers of passive electronic components and their mission is to become an integrated-business institution supplying the world’s leading